

PATENT ABSTRACTS OF JAPAN

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(71)Applicant : SONY CORP

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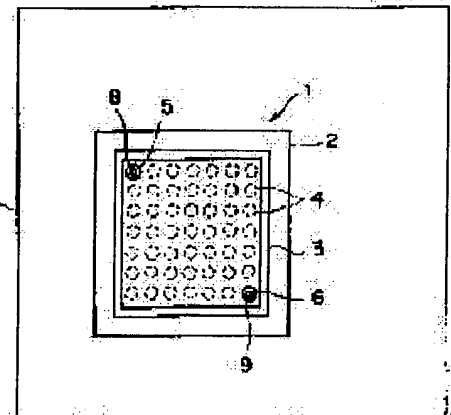
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(54) ELECTRONIC COMPONENT FOR MOUNTING AND MOUNTING OF ELECTRONIC COMPONENT FOR MOUNTING

(57)Abstract:

PURPOSE: To facilitate a mounting alignment of an electronic component for mounting with a main substrate by a method wherein when the electronic component for mounting is mounted on the main substrate, through holes provided in the electronic component are aligned with recognition marks, which respectively correspond to the through holes, on the main substrate.

CONSTITUTION: Through holes 5 and 6 are bored in prescribed positions on a main substrate 7 in such a way that the holes 5 and 6 are respectively made to correspond to at least two recognition marks 8 and 9 or more formed at the prescribed positions. When an electronic component 1 for mounting is mounted on the substrate 7, the component 1 is aligned with the substrate 7 on the basis of the relation between the positions of the marks 8 and 9 and the relation between the positions of the holes 5 and 6, which respectively correspond to the marks 8 and 9. Moreover, the component 1 is provided with mounting substrates 2 and 3, which are mounted with a prescribed number of circuit elements, and metal bumps 4, which are provided on the sides of the rears to the surfaces, which are mounted with the circuit elements, of the substrates 2 and 3 and are provided in such a way as to correspond to a wiring pattern of the substrate 7.



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CLAIMS

[Claim(s)]

[Claim 1] Electronic parts for mounting characterized by having made it correspond to at least two or more recognition marks formed in a predetermined location on the above-mentioned main substrate in electronic parts for mounting mounted in a predetermined location of the main substrate in which a predetermined circuit pattern was formed, respectively, and drilling a breakthrough in a predetermined location.

[Claim 2] They are the electronic parts according to claim 1 for mounting carry out having the metal bump whom it comes to arrange corresponding to the above-mentioned circuit pattern of the above-mentioned main substrate while flow connection is made with wiring of a predetermined number which the above-mentioned electronic parts for mounting were prepared in a rear-face side to a field where each above-mentioned circuit element of a mounting substrate with which a circuit element of a predetermined number was mounted, and the above-mentioned mounting substrate was mounted, and was pulled out from each above-mentioned circuit element as the feature.

[Claim 3] Each above-mentioned breakthrough of the above-mentioned electronic parts for mounting is electronic parts for mounting according to claim 2 characterized by preparing in an outside edge on the diagonal line mutually among parts which a desired metal bump deserves out of each above-mentioned metal bump of the above-mentioned mounting substrate.

[Claim 4] Electronic parts for mounting according to claim 2 characterized by drawing a predetermined graduation to each above-mentioned transparence member, respectively while laying a predetermined transparence member under each above-mentioned breakthrough of the above-mentioned electronic parts for mounting, respectively.

[Claim 5] Apertures of each above-mentioned breakthrough of the above-mentioned electronic parts for mounting are electronic parts for mounting according to claim 2 characterized by puncturing greatly a little rather than the above-mentioned metal bump's outer diameter, respectively.

[Claim 6] In an electronic-parts mounting method for mounting of mounting electronic parts for mounting in a predetermined location of the main substrate in which a predetermined circuit pattern was formed At least two or more recognition marks formed in a predetermined location on the above-mentioned main substrate are formed. When it is made to correspond to each above-mentioned recognition mark, respectively, a breakthrough is drilled in the above-mentioned electronic parts for mounting, respectively and the above-mentioned electronic parts for mounting are mounted on the above-mentioned main substrate, An electronic-parts mounting method for mounting characterized by carrying out alignment of the above-mentioned electronic parts for mounting to the above-mentioned main substrate based on physical relationship of each above-mentioned breakthrough corresponding to each above-mentioned recognition mark and each above-mentioned recognition mark.

[Claim 7] It is the electronic-parts mounting method according to claim 6 for mounting of carrying out having the metal bump whom it comes to be arranged corresponding to the above-mentioned circuit pattern of the above-mentioned main substrate while flow connection is made with wiring of the predetermined number which the above-mentioned electronic parts for mounting were prepared in a

rear-face side to a field where each above-mentioned circuit element of a mounting substrate with which a circuit element of a predetermined number was mounted, and the above-mentioned mounting substrate was mounted, and was pulled out from each above-mentioned circuit element as the feature.

[Claim 8] Each above-mentioned breakthrough of the above-mentioned electronic parts for mounting is the electronic-parts mounting method for mounting according to claim 7 characterized by preparing in an outside edge on the diagonal line mutually among parts which a desired metal bump deserves out of each above-mentioned metal bump of the above-mentioned mounting substrate.

[Claim 9] An electronic-parts mounting method for mounting according to claim 7 characterized by drawing a predetermined graduation to each above-mentioned transparence member, respectively while laying a predetermined transparence member under each above-mentioned breakthrough of the above-mentioned electronic parts for mounting, respectively.

[Claim 10] An aperture of each above-mentioned breakthrough of the above-mentioned electronic parts for mounting is the electronic-parts mounting method for mounting according to claim 7 characterized by puncturing greatly a little rather than the above-mentioned metal bump's outer diameter, respectively.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Table of Contents] This invention is explained in order of the following.

Technical-problem The means for solving a technical problem which field-of-the-invention Prior-art invention on industry tends to solve (drawing 1 - drawing 4)

Operation (drawing 1 - drawing 4)

Example (drawing 1 - drawing 4)

Effect-of-the-invention [0002]

[Industrial Application] This invention is applied to the electronic parts for mounting and the electronic-parts mounting method for mounting that the semiconductor chip was closed in the package, concerning the electronic parts for mounting, and the electronic-parts mounting method for mounting, and is suitable.

[0003]

[Description of the Prior Art] Conventionally, there is a ball shot array (this is hereafter called BGA) by which the metal bump of a predetermined number was arranged in the rear-face (namely, plane of composition with main substrate) side of the package which closes a semiconductor device in the shape of a grid as a terminal for external connection as this kind of electronic parts for mounting.

[0004] That is, the circuit board which the signal line which becomes with conductors, such as silver or copper, becomes from the configuration wired by the predetermined pattern is prepared in the front face of the base material with which BGA made the insulating layer organic materials, such as for example, inorganic materials, such as a ceramic, and glass epoxy.

[0005] On the other hand, on the other hand, die bonding of the semiconductor device is carried out to the side, and after connecting with the metal wire of the base material of BGA which the electrode terminal of the semiconductor device concerned and the electrode element of the circuit board become by wirebonding, i.e., gold, through a through hole, respectively therefore, it is made as [protect / therefore / to carry out an overcoat by resin, such as epoxy, or put a metaled cap / the semiconductor device concerned].

[0006] In this case, the signal line of the predetermined number pulled out from the semiconductor device is made as [constitute / through a through hole /, respectively / in the rear-face side of a package / circuit wiring of a predetermined pattern]. It is made as [form / a ball electrode] by furthermore joining directly the metal ball of the predetermined number which the land for connecting with the external main substrate (mother board) electrically, respectively is prepared, and the metal ball of a predetermined number is joined using solder etc. corresponding to the land concerned, or becomes with solder to the circuit wiring concerned.

[0007] When the number and density of a signal line which were pulled out by the circuit board from the semiconductor device are buildup, it is necessary to carry out two or more laminatings of the circuit board, and to multilayer here. For this reason, after carrying out a laminating so that a **** intermediary, an insulating layer, and the layer that has circuit wiring may be put by turns for carrying

out the laminating of the circuit board one by one, and multilayering, it is made as [connect / therefore / to connecting through two or more through holes in which between these layers was established by each circuit board / the electrode terminal of a semiconductor device, and the land on the rear face of a package].

[0008] In connecting the circuit board of such BGA to the external main substrate and an external electric target practically, after carrying out alignment of the ball electrode of a predetermined number and the land of the external main substrate which were arranged by the predetermined pattern to the circuit board of the BGA concerned relatively and mounting them on it, it is made as [join / to carrying out a reflow / therefore].

[0009] After centering BGA therefore by the mechanical chuck of automatic components mounting equipment (not shown), relative-position doubling is specifically carried out to the land and indirect target of the main substrate, and the method of mounting BGA on the main substrate concerned is proposed. Moreover, the center position of the BGA concerned is calculated using visual-recognition equipment (not shown) from the appearance configuration of BGA, and after carrying out relative-position doubling to the external land and external indirect target of the main substrate based on the count result concerned, the method of mounting BGA on the main substrate concerned is also proposed.

[0010]

[Problem(s) to be Solved by the Invention] However, the problem that it cannot check in what kind of physical relationship an operator has the land of the external main substrate to each ball electrode of BGA, respectively actually when alignment of the ball electrode formed in a part for each electrode terminal area of the circuit board of BGA is carried out relatively [land / of the external main substrate], respectively according to the above methods is *****.

[0011] How to irradiate an X-ray beam and to check the relative-position relation between BGA and the external main substrate therefore to that transmission image as one method for solving this problem is considered. However, it is difficult to check the location of each ball electrode, and the location of each land of the main substrate corresponding to this, since these layers superimpose an operator when the circuit board of BGA or the external main substrate is constituted by the multilayer, and it is visible in the condition, and a still inadequate problem is *****.

[0012] The method of therefore trying only the check of alignment using the circuit board of BGA as the so-called mechanical sample which consisted of only the electrode elements and ball electrodes instead of a multilayer board as one method that I accept it in order to solve this problem furthermore is proposed. however -- the external main substrate continues being a multilayer board -- too -- an operator -- ** -- an intermediary -- the problem that the layer of these will be overlapped and it will be visible is solved -- having -- inside ****.

[0013] This invention was made in consideration of the above point, and tends to propose the electronic parts for mounting and the electronic-parts mounting method for mounting of making easy mounting position doubling of the electronic parts for mounting to the main substrate.

[0014]

[Means for Solving the Problem] In order to solve this technical problem, it is made to correspond to at least two or more recognition marks 8 and 9 formed in a predetermined location on the main substrate 7 in the electronic parts 1 for mounting mounted in a predetermined location of the main substrate 7 in which a predetermined circuit pattern was formed in this invention, respectively, and breakthroughs 5 and 6 are drilled in a predetermined location.

[0015] Moreover, it sets to an electronic-parts mounting method for mounting of mounting the electronic parts 1 for mounting in a predetermined location of the main substrate 7 in which a predetermined circuit pattern was formed in this invention. At least two or more recognition marks 8 and 9 formed in a predetermined location on the main substrate 7 are formed. When it is made to correspond to each recognition marks 8 and 9, respectively, breakthroughs 5 and 6 are drilled in the electronic parts 1 for mounting, respectively and the electronic parts 1 for mounting are mounted on the main substrate 7, Based on physical relationship of each breakthroughs 5 and 6 corresponding to each recognition marks 8 and 9 and each recognition marks 8 and 9, it is made to carry out alignment of the electronic

parts 1 for mounting to the main substrate 7.

[0016] Furthermore, in this invention, the electronic parts 1 for mounting are formed in a rear-face side to a field where each circuit element of the mounting substrates 2 and 3 with which a circuit element of a predetermined number was mounted, and the mounting substrates 2 and 3 was mounted, and they are equipped with the metal bump 4 whom it comes to arrange corresponding to a circuit pattern of the main substrate 7 while flow connection is made with wiring of a predetermined number pulled out from each circuit element.

[0017]

[Function] When the electronic parts 1 for mounting are mounted on the main substrate 7, mounting position doubling of the electronic parts 1 for mounting to the main substrate 7 can be made easy by having been made to carry out alignment of each breakthroughs 5 and 6 of the electronic parts 1 for mounting concerned to the recognition marks 8 and 9 on the main substrate 7 which corresponds, respectively.

[0018]

[Example] About a drawing, one example of this invention is explained in full detail below.

[0019] In drawing 1, 1 is made as [carry out / packaging of the semiconductor device concerned] by showing BGA as a whole and carrying out the overcoat of the semiconductor device (not shown) by which die bonding is carried out on the front face of the circuit board 2 by the closure member 3 which becomes with an epoxy resin.

[0020] Moreover, it connects with the electrode element (not shown) currently arranged in the rear-face side of the circuit board 2 by the predetermined pattern through the through hole (not shown), respectively, and the signal line (not shown) of the predetermined number pulled out from this semiconductor device is made as [form / therefore / in joining a solder ball further corresponding to the electrode element concerned, respectively / the ball electrode terminal 4]. in this case, the ball [an appearance is mostly fabricated by the square tabular configuration, as for the circuit board 2, responds to this, and] electrode terminal 4 on the field of the circuit board 2 concerned -- the shape of a grid -- a column and each horizontal train -- it is allotted by the same number [every] predetermined pattern.

[0021] Here, in BGA1, the larger tooling holes 5 and 6 a little than the outer diameter of the ball electrode terminal 4 concerned are drilled, without at least two endmost parts which are on the diagonal line mutually out of the ball electrode terminal 4 arranged in the shape of a grid on the field of the circuit board 2 forming the ball electrode terminal 4 for (calling this part a diagonal endmost part hereafter, respectively), respectively. Thereby by viewing the main substrate (not shown) through the tooling holes 5 and 6 drilled in that of BGA1, an operator can check the location gap with the land of the main substrate corresponding to tooling holes 5 and 6 and this concerned.

[0022] An operator uses a **** intermediary for drilling these two tooling holes 5 and 6 in practice, after ending like the manufacture line of BGA1 first, he uses perforation tools (not shown), such as a drill, and alignment only of the two diagonal endmost parts in the circuit board 2 and the closure member 3 of BGA1 is carried out. After an operator's carrying out alignment so that the center position like two diagonal endmost parts (namely, center position of the ball electrode terminal 4 originally established in the part concerned, respectively) and the center position of tooling holes 5 and 6 may be in agreement first, respectively in that case, drilling processing is carried out from the field side which has the ball electrode terminal 4 of the circuit board 2. Or after irradiating an X-ray beam and checking beforehand the location like two diagonal endmost parts of the circuit board 4, drilling processing is carried out from the field which does not have the ball electrode terminal 4 of the circuit board 2.

[0023] When selecting the aperture of tooling holes 5 and 6 here, and the aperture of tooling holes 5 and 6 is smaller than the outer diameter (this is hereafter called the diameter of a ball) of the ball electrode terminal 4, since it becomes smaller identically to the magnitude of the land of the circuit board 2 than the land concerned, even if the location gap of some has occurred, an operator has a problem of it becoming impossible to check a location gap. On the other hand, when the aperture of tooling holes 5 and 6 is made too much larger than the diameter of a ball, it interferes with the ball electrode terminal 4 with which others adjoin, and an operator has a problem of it becoming impossible to check a location

gap also in this case. The aperture of tooling holes 5 and 6 is drilled by the larger degree a little than the diameter of a ball that this problem should be solved. That is, the diameter of a ball of the ball electrode terminal 4 in being 0.8 [mm], the aperture of tooling holes 5 and 6 is punctured so that it may be set to 1.2 [mm].

[0024] In the above configuration, in case each ball electrode terminal 4 of BGA1 is mounted on the land to which the main substrate 7 corresponds, respectively at drawing 2 so that it may be shown, alignment of the two tooling holes 5 and 6 drilled by the circuit board 2 of BGA1 is carried out to the lands 8 and 9 to which the main substrate 7 corresponds, respectively.

[0025] In drawing 3, the positioning condition of two tooling holes 5 and 6 drilled by the circuit board 2 and the closure member 3 of BGA1 and the lands 8 and 9 of the main substrate 7 corresponding to the tooling holes 5 and 6 concerned is shown here. First, when alignment of the two tooling holes 5 and 6 drilled by the circuit board 2 of BGA1 is carried out to the lands 8 and 9 and accuracy to which the main substrate 7 corresponds, respectively, both centers with the lands 8 and 9 corresponding to tooling holes 5 and 6 and this concerned will be in the same location condition (drawing 3 (A)).

[0026] Moreover, when alignment of the two tooling holes 5 and 6 drilled by the circuit board 2 of BGA1 is not carried out to accuracy to the lands 8 and 9 to which the main substrate 7 corresponds, respectively, a location gap (this is hereafter called the amount of location gaps) of predetermined distance w minutes arises in the predetermined direction in the center position of the tooling holes 5 and 6 concerned, and the center position of the lands 8 and 9 corresponding to this (drawing 3 (B)).

[0027] BGA1 can be mounted on the exact location of the main substrate 7 by measuring the amount w of location gaps concerned using measuring devices, such as a microscope or a projector, and amending the mounting location of BGA1 in this way, based on the measurement result concerned. Furthermore, since the amount w of location gaps is measured in two places in this case, ***** can also measure [the location gap direction over the main substrate 7 of BGA1] the amount of location gaps not only in the X-axis and Y shaft orientations but in the direction of an angle of rotation.

[0028] By having drilled the respectively larger tooling holes 5 and 6 a little than the appearance of the ball electrode terminal 4 at least in two diagonal endmost parts out of the ball electrode terminal 4 arranged in the shape of a grid on the field of the circuit board 2 in BGA1 according to the above configuration After mounting each ball electrode terminal 4 of BGA1 on the land to which the main substrate 7 corresponds, respectively, a relative position with the lands 8 and 9 corresponding to tooling holes 5 and 6 and this concerned can be checked easily. In this way, by the former, it can check from the outside and the alignment condition of **** BGA 1 in profit and the main substrate 7 can be directly inspected visually from the upper part of BGA1.

[0029] In addition, although the case where tooling holes 5 and 6 were formed at least in two diagonal endmost parts on the field of the circuit board 2 in BGA1, respectively was described in the above-mentioned example As shown not only in this but in drawing 4, even if this invention lays underground the transparent epoxy resins (this is hereafter called a window part with a graduation) 10 and 11 which a predetermined graticule is drawn by the surface portion and become it at the above-mentioned tooling holes 5 and 6, respectively, it can apply this invention.

[0030] In this case, after mounting each ball electrode terminal 4 of BGA1 on the land to which the main substrate 7 corresponds, respectively, the same effect as an above-mentioned case will be acquired by carrying out alignment of the window parts 10 and 11 with a graduation prepared in the circuit board 2 of BGA1 to the lands 8 and 9 to which the main substrate 7 corresponds, respectively.

[0031] An operator uses a **** intermediary for incidentally forming the window parts 10 and 11 with a graduation, after ending like the manufacture line of BGA1 first, he uses perforation tools (not shown), such as a drill, and drilling processing of the two tooling holes 5 and 6 in the circuit board 2 and the closure member 3 of BGA1 is carried out. Then, after making the tooling holes 5 and 6 concerned pour in and harden a respectively transparent epoxy resin, the graticule predetermined [a field to] which has the ball electrode terminal 4 of the circuit board 2 is drawn so that the center position of tooling holes 5 and 6 may therefore be irradiating a laser beam using a predetermined laser beam machine (not shown) with criteria. For example, the pitch of 0.01 [mm] and a graduation this predetermined graticule It is

referred to as 0.1 [mm]. [the width of face of a line] Moreover, by applying and drawing a color, an operator can inspect an above-mentioned graticule visually markedly easily.

[0032] Although the case where tooling holes 5 and 6 were formed at least in two endmost parts which have opposite physical relationship mutually on the same diagonal line in a further above-mentioned example out of the ball electrode terminal 4 arranged in the shape of a grid on the field of the circuit board 2 of BGA1 was described This invention may be prepared not only in this but in the predetermined part to which at least the endmost part concerned has the ball electrode terminal 4 of an except, respectively, the number of the tooling holes at this time is not limited to two pieces, but its ***** is also still better at three or more pieces.

[0033] Although the case where tooling holes 5 and 6 were formed at least in two endmost parts which have opposite physical relationship mutually on the same diagonal line in a further above-mentioned example out of the ball electrode terminal 4 arranged in the shape of a grid on the field of the circuit board 2 of BGA1 was described Even if this invention prepares tooling holes not only this but both [one side or] two endmost parts which have opposite physical relationship mutually on another diagonal line further in addition to the tooling holes 5 and 6 concerned, it can apply this invention. [both]

[0034] Although the case where made the circuit board 2 and the closure member 3 of BGA1 penetrate, and tooling holes 5 and 6 were drilled [in / both / a further above-mentioned example] was described When tooling holes are drilled in the predetermined part which the ball electrode terminal 4 arranged on the field of not only this but the circuit board 2 has, only the circuit board 2 is penetrated and the closure member 3 does not penetrate, even if this invention drills tooling holes in the part concerned, it can apply this invention.

[0035] Although the case where tooling holes were drilled in the predetermined part which the ball electrode terminal 4 arranged on the field of the circuit board 2 has was described, you may make it this invention prepare tooling holes in predetermined parts other than the part which the ball electrode terminal 4 on the field of not only this but the circuit board 2 has in a further above-mentioned example.

[0036] In this case, when alignment of each ball electrode terminal 4 of BGA1 is carried out to the land to which the main substrate 7 corresponds, respectively at accuracy, the mark for alignment is attached to the predetermined location of the main substrate 7 corresponding to the tooling holes of the predetermined number drilled by the circuit board 2, respectively. Thereby, an operator can check easily the relative position of tooling holes and the mark corresponding to this, and can acquire the same effect as an above-mentioned case in this way.

[0037]

[Effect of the Invention] When the electronic parts for mounting are mounted on the main substrate as mentioned above according to this invention, mounting position doubling of the electronic parts for mounting to the main substrate can be made easy by having been made to carry out alignment of each breakthrough of the electronic parts for mounting concerned to the recognition mark on the main substrate which corresponds, respectively. By the former, the electronic parts for mounting and the electronic-parts mounting method for mounting of being able to check from the outside and inspecting visually the alignment condition of the electronic parts for **** mounting in profit and the main substrate directly from the upper part of the electronic parts for mounting concerned can be realized in this way.

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] It is the perspective diagram showing BGA by one example of this invention.

[Drawing 2] It is the plan showing the mounting condition to the main substrate of BGA by this invention.

[Drawing 3] It is the partial plan showing the alignment condition of BGA by this invention, and the main substrate.

[Drawing 4] It is the partial plan showing the alignment condition of BGA by other examples, and the main substrate.

[Description of Notations]

1 [.. 5 A ball electrode terminal, 6 / .. Tooling holes, 7 / .. 8 A main substrate, 9 / .. 10 A land, 11 / .. Window part with a graduation.] BGA, 2 .. The circuit board, 3 .. A closure member, 4

[Translation done.]

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TITLE: Electronic component for PCB mounting e.g. BGA
semiconductor package - has through-holes that
correspond to positions of recognition marks formed on main
substrate

PATENT-ASSIGNEE: SONY CORP[SONY]

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ABSTRACTED-PUB-NO: JP 08125396A

BASIC-ABSTRACT:

The component is provided with at least two through-holes (5,6) drilled at
predetermined positions.

The positions of the through-holes correspond to the positions of
several
recognition marks formed on a main substrate (7).

ADVANTAGE - Facilitates alignment and mounting of electronic component
on main
substrate. Enables confirmation of alignment state of component from
upper
part of electronic component.

CHOSEN-DRAWING: Dwg.2/4

TITLE-TERMS: ELECTRONIC COMPONENT PCB MOUNT SEMICONDUCTOR PACKAGE
THROUGH HOLE

CORRESPOND POSITION RECOGNISE MARK FORMING MAIN SUBSTRATE

DERWENT-CLASS: U11 V04

EPI-CODES: U11-D01; U11-D01A3; U11-D01A5; V04-Q05; V04-R04F; V04-V01;

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(54) 【発明の名称】 実装用電子部品及び実装用電子部品実装方法

(57) 【要約】

【目的】本発明は、主基板に対する実装用電子部品の実装位置合わせを容易にし得る実装用電子部品及び実装用電子部品実装方法を実現しようとするものである。

【構成】実装用電子部品を主基板にマウントしたとき、当該実装用電子部品の各貫通孔をそれぞれ対応する主基板上の認識マークと位置合わせするようにしたことにより、主基板に対する実装用電子部品の実装位置合わせを容易にし得る。かくして従来では外部から確認し得なかつた実装用電子部品と主基板との位置合わせ状態を当該実装用電子部品の上方から直接目視確認することができる実装用電子部品及び実装用電子部品実装方法を実現し得る。

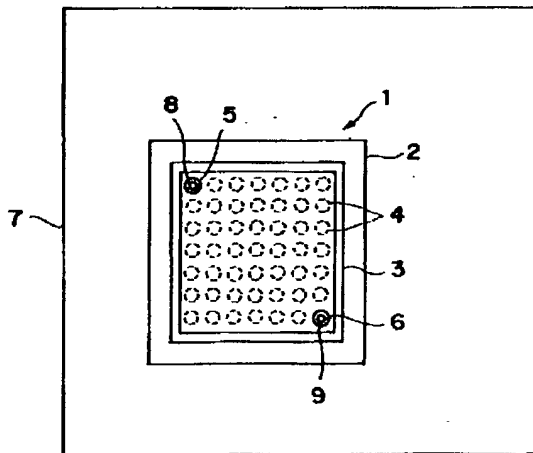


図 2 BGAの主基板に対するマウント状態

【特許請求の範囲】

【請求項1】所定の配線パターンが形成された主基板の所定位置に実装される実装用電子部品において、上記主基板上の所定位置に形成された少なくとも2以上の認識マークにそれぞれ対応させて、所定位置に貫通孔が穿設されたことを特徴とする実装用電子部品。

【請求項2】上記実装用電子部品は、所定数の回路素子が実装された実装基板と、上記実装基板の各上記回路素子が実装された面に対して裏面側に設けられ、各上記回路素子から引き出された所定数の配線と導通接続されると共に、上記主基板の上記配線パターンに対応して配設されてなる金属バンプとを具えることを特徴とする請求項1に記載の実装用電子部品。

【請求項3】上記実装用電子部品の各上記貫通孔は、上記実装基板の各上記金属バンプの中から所望の金属バンプに相当する部位のうち互いに対角線上における外側端部に設けることを特徴とする請求項2に記載の実装用電子部品。

【請求項4】上記実装用電子部品の各上記貫通孔に、それぞれ所定の透明部材を埋設すると共に又は、各上記透明部材にそれぞれ所定の目盛を描画することを特徴とする請求項2に記載の実装用電子部品。

【請求項5】上記実装用電子部品の各上記貫通孔の孔径は、それぞれ上記金属バンプの外径よりも若干大きく穿設することを特徴とする請求項2に記載の実装用電子部品。

【請求項6】所定の配線パターンが形成された主基板の所定位置に実装用電子部品を実装する実装用電子部品実装方法において、上記主基板上の所定位置に形成された少なくとも2以上の認識マークを形成し、各上記認識マークにそれぞれ対応させて、上記実装用電子部品にそれぞれ貫通孔を穿設し、上記実装用電子部品を上記主基板にマウントしたとき、各上記認識マーク及び各上記認識マークに対応する各上記貫通孔の位置関係に基づいて、上記実装用電子部品を上記主基板に対して位置合わせすることを特徴とする実装用電子部品実装方法。

【請求項7】上記実装用電子部品は、所定数の回路素子が実装された実装基板と、上記実装基板の各上記回路素子が実装された面に対して裏面側に設けられ、各上記回路素子から引き出された所定数の配線と導通接続されると共に、上記主基板の上記配線パターンに対応して配設されてなる金属バンプとを具えることを特徴とする請求項6に記載の実装用電子部品実装方法。

【請求項8】上記実装用電子部品の各上記貫通孔は、上記実装基板の各上記金属バンプの中から所望の金属バンプに相当する部位のうち互いに対角線上における外側

端部に設けることを特徴とする請求項7に記載の実装用電子部品実装方法。

【請求項9】上記実装用電子部品の各上記貫通孔に、それぞれ所定の透明部材を埋設すると共に又は、各上記透明部材にそれぞれ所定の目盛を描画することを特徴とする請求項7に記載の実装用電子部品実装方法。

【請求項10】上記実装用電子部品の各上記貫通孔の孔径は、それぞれ上記金属バンプの外径よりも若干大きく穿設することを特徴とする請求項7に記載の実装用電子部品実装方法。

【発明の詳細な説明】

【0001】

【目次】以下の順序で本発明を説明する。

産業上の利用分野

従来の技術

発明が解決しようとする課題

課題を解決するための手段(図1～図4)

作用(図1～図4)

実施例(図1～図4)

20 発明の効果

【0002】

【産業上の利用分野】本発明は実装用電子部品及び実装用電子部品実装方法に関し、例えば半導体チップがパッケージ内に封止された実装用電子部品及び実装用電子部品実装方法に適用して好適なものである。

【0003】

【従来の技術】従来、この種の実装用電子部品として、半導体素子を封止するパッケージの裏面(すなわち主基板との接合面)側に外部接続用の端子として格子状に所定数の金属バンプが配設されたボールグリットアレイ(以下、これをBGAと呼ぶ)がある。

【0004】すなわちBGAは、例えばセラミックス等の無機材料や例えばガラスエポキシ等の有機材料を絶縁層とした基材の表面に例えば銀又は銅等の導電体でなる信号線が所定パターンに配線された構成からなる回路基板が設けられている。

【0005】一方、BGAの基材の他面側に半導体素子がダイボンディングされており、当該半導体素子の電極端子と回路基板の電極素子とがそれぞれスルーホールを介してワイヤボンディング、すなわち例えば金でなる金属線によつて接続した後、エポキシ等の樹脂でオーバーコートするか、または金属等のキャップを被せることによつて当該半導体素子を保護するようになされている。

【0006】この場合、半導体素子から引き出された所定数の信号線は、それぞれスルーホールを介してパッケージの裏面側において所定のパターンの回路配線を構成するようになされている。さらに当該回路配線には、それぞれ外部の主基板(マザーボード)と電気的に接続するためのランドが設けられ、当該ランドに対応して所定数の金属ボールがはんだ等を用いて接合されるか、又は

はんだでなる所定数の金属ボールが直接接合されることによりボール電極が形成されるようになされている。

【0007】ここで、半導体素子から回路基板に引き出された信号線の数及び密度が増大である場合には、回路基板を複数積層させて多層化する必要がある。このため回路基板を順次積層させて多層化するにあたって、絶縁層と回路配線を有する層とを交互に挟み込むように積層した後、これらの層間をそれぞれの回路基板に設けられた複数のスルーホールを介して接続することによつて半導体素子の電極端子とパッケージ裏面のランドとを接続するようになされている。

【0008】実用上、このようなBGAの回路基板を外部の主基板と電気的に接続する場合には、当該BGAの回路基板に所定のパターンで配設された所定数のボール電極と外部の主基板のランドとを相対的に位置合わせしてマウントした後、リフローすることによつて接合するようになされている。

【0009】具体的には、BGAを自動部品マウント装置（図示せず）のメカニカルチャックによつてセンタリングした後主基板のランドと間接的に相対位置合わせして、当該主基板にBGAをマウントする方法が提案されている。また、BGAの外形状から視覚認識装置（図示せず）を用いて当該BGAの中心位置を計算し、当該計算結果に基づいて外部の主基板のランドと間接的に相対位置合わせした後当該主基板にBGAをマウントする方法も提案されている。

【0010】

【発明が解決しようとする課題】ところが、上述のような方法によれば、BGAの回路基板の各電極端子部分に形成されたボール電極をそれぞれ外部の主基板のランドと相対的に位置合わせした場合、オペレータは実際にBGAの各ボール電極に対してそれぞれ外部の主基板のランドがどのような位置関係にあるのかを確認することができないという問題があった。

【0011】この問題を解決するための一つの方法として、X線ビームを照射してその透過像によつてBGAと外部の主基板との相対位置関係を確認する方法が考えられている。ところが、BGAの回路基板又は外部の主基板が多層に構成されている場合には、オペレータはこれらの層が重畳して状態で見えてしまうことから、各ボール電極の位置及びこれに対応する主基板の各ランドの位置を確認することが困難であり、未だ不十分な問題があった。

【0012】さらにこの問題を解決するためのもう一つの方法として、BGAの回路基板を多層板ではなく電極素子とボール電極のみで構成されたいわゆるメカニカルサンプルとして用いることによつて位置合わせの確認のみを試行する方法が提案されている。ところが、外部の主基板が多層板のままではやはりオペレータにとつてこれらの層が重畳して見えてしまうという問題は解決され

なかつた。

【0013】本発明は以上の点を考慮してなされたもので、主基板に対する実装用電子部品の実装位置合わせを容易にし得る実装用電子部品及び実装用電子部品実装方法を提案しようとするものである。

【0014】

【課題を解決するための手段】かかる課題を解決するため本発明においては、所定の配線パターンが形成された主基板7の所定位置に実装される実装用電子部品1において、主基板7上の所定位置に形成された少なくとも2以上の認識マーク8、9にそれぞれ対応させて、所定位置に貫通孔5、6が穿設されるようにする。

【0015】また本発明においては、所定の配線パターンが形成された主基板7の所定位置に実装用電子部品1を実装する実装用電子部品実装方法において、主基板7上の所定位置に形成された少なくとも2以上の認識マーク8、9を形成し、各認識マーク8、9にそれぞれ対応させて、実装用電子部品1にそれぞれ貫通孔5、6を穿設し、実装用電子部品1を主基板7にマウントしたとき、各認識マーク8、9及び各認識マーク8、9に対応する各貫通孔5、6の位置関係に基づいて、実装用電子部品1を主基板7に対して位置合わせするようにする。

【0016】さらに本発明においては、実装用電子部品1は、所定数の回路素子が実装された実装基板2、3と、実装基板2、3の各回路素子が実装された面に対して裏面側に設けられ、各回路素子から引き出された所定数の配線と導通接続されると共に、主基板7の配線パターンに対応して配設されてなる金属バンパ4とを備えるようにする。

【0017】

【作用】実装用電子部品1を主基板7にマウントしたとき、当該実装用電子部品1の各貫通孔5、6をそれぞれ対応する主基板7上の認識マーク8、9と位置合わせするようにしたことにより、主基板7に対する実装用電子部品1の実装位置合わせを容易にし得る。

【0018】

【実施例】以下図面について、本発明の一実施例を詳述する。

【0019】図1において1は全体としてBGAを示し、回路基板2の表面上にダイボンディングされている半導体素子（図示せず）を例えばエポキシ樹脂でなる封止部材3でオーバーコートすることにより、当該半導体素子をパッケージングするようになされている。

【0020】またこの半導体素子から引き出された所定数の信号線（図示せず）は、それぞれスルーホール（図示せず）を介して回路基板2の裏面側に所定のパターンで配設されている電極素子（図示せず）と接続され、さらに当該電極素子に対応してそれぞれはんだボールを接合することによつてボール電極端子4が形成されるようになされている。この場合、回路基板2は外形がほぼ正

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方形の板形状に成形され、これに応じて当該回路基板2の面上におけるボール電極端子4は、格子状に縦列及び横列それぞれ同数ずつ所定のパターンで配されている。

【0021】ここで、BGA1において、回路基板2の面上に格子状に配列されているボール電極端子4の中から互いに対角線上にある2箇所の最端部位（以下、この部位をそれぞれ対角最端部位と呼ぶ）には、それぞれボール電極端子4を設けることなく、当該ボール電極端子4の外径よりも若干大きい位置決め孔5及び6が穿設されている。これによりオペレータはBGA1の面に穿設された位置決め孔5及び6を介して主基板（図示せず）を目視することにより、当該位置決め孔5及び6とこれに対応する主基板のランドとの位置ずれを確認することができる。

【0022】實際上、この2個の位置決め孔5及び6を穿設するにあたって、まずBGA1の製造行程を終了した後に、オペレータがドリル等の穴開け工具（図示せず）を用いてBGA1の回路基板2及び封止部材3における2箇所の対角最端部位を位置合わせする。その際、まずオペレータは2箇所の対角最端部位の中心位置（すなわち当該部位に本来それぞれ設けられていたボール電極端子4の中心位置）と、位置決め孔5及び6の中心位置とがそれぞれ一致するように位置合わせした後、回路基板2のボール電極端子4を有する面側から穿設加工する。またはX線ビームを照射して回路基板4の2箇所の対角最端部位の位置を予め確認しておいた後、回路基板2のボール電極端子4を有しない面から穿設加工する。

【0023】ここで位置決め孔5及び6の孔径を選定する場合において、位置決め孔5及び6の孔径がボール電極端子4の外径（以下、これをボール径と呼ぶ）よりも小さい場合には、回路基板2のランドの大きさと同一又は当該ランドよりも小さくなることから、多少の位置ずれが発生していてもオペレータは位置ずれを確認し得なくなるといった問題がある。一方、位置決め孔5及び6の孔径をボール径よりも大きくし過ぎると他の隣接するボール電極端子4と干渉してしまい、この場合もオペレータは位置ずれを確認し得なくなるといった問題がある。この問題を解決すべく、位置決め孔5及び6の孔径はボール径よりも若干大きい程度に穿設されている。すなわち例えばボール電極端子4のボール径が0.8[mm]の場合には、位置決め孔5及び6の孔径が1.2[mm]となるように穿設されている。

【0024】以上の構成において、図2に示すようにBGA1の各ボール電極端子4をそれぞれ主基板7の対応するランドにマウントする際、BGA1の回路基板2に穿設された2個の位置決め孔5及び6がそれぞれ主基板7の対応するランド8及び9に位置合わせされる。

【0025】ここで図3において、BGA1の回路基板2及び封止部材3に穿設された2個の位置決め孔5及び

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6と、当該位置決め孔5及び6に対応する主基板7のランド8及び9との位置決め状態を示す。まず、BGA1の回路基板2に穿設された2個の位置決め孔5及び6がそれぞれ主基板7の対応するランド8及び9と正確に位置合わせされている場合には、当該位置決め孔5及び6とこれに対応するランド8及び9との中心が共に同一の位置状態になる（図3（A））。

【0026】また、BGA1の回路基板2に穿設された2個の位置決め孔5及び6がそれぞれ主基板7の対応するランド8及び9に対して正確に位置合わせされていない場合には、当該位置決め孔5及び6の中心位置とこれに対応するランド8及び9の中心位置とで所定方向に所定距離w分の位置ずれ（以下、これを位置ずれ量と呼ぶ）が生じる（図3（B））。

【0027】かくして、当該位置ずれ量wを例えば顕微鏡又は投影機等の測定装置を用いて測定し、当該測定結果に基づいてBGA1のマウント位置を補正することにより、BGA1を主基板7の正確な位置にマウントすることができる。さらにこの場合、位置ずれ量wは2箇所において測定されることから、BGA1の主基板7に対する位置ずれ方向が、X軸及びY軸方向のみならず回転角方向であつても位置ずれ量を測定することができる。

【0028】以上の構成によれば、BGA1において回路基板2の面上に格子状に配列されているボール電極端子4の中から2箇所の対角最端部位にそれぞれボール電極端子4の外径よりも若干大きい位置決め孔5及び6を穿設したことにより、BGA1の各ボール電極端子4をそれぞれ主基板7の対応するランドにマウントした後、当該位置決め孔5及び6とこれに対応するランド8及び9との相対位置を容易に確認し得る。かくして従来では外部から確認し得なかつたBGA1と主基板7との位置合わせ状態をBGA1の上方から直接目視確認することができる。

【0029】なお上述の実施例においては、BGA1における回路基板2の面上の2箇所の対角最端部位にそれぞれ位置決め孔5及び6を設けた場合について述べたが、本発明はこれに限らず、図4に示すように、上述の位置決め孔5及び6にそれぞれ表面部分に所定の方眼目盛が描画されてなる透明なエポキシ樹脂（以下、これを目盛付窓部と呼ぶ）10及び11を埋設するようにしても本発明を適用し得る。

【0030】この場合、BGA1の各ボール電極端子4をそれぞれ主基板7の対応するランドにマウントした後、BGA1の回路基板2に設けられた目盛付窓部10及び11をそれぞれ主基板7の対応するランド8及び9に位置合わせすることにより、上述の場合と同様の効果が得られることとなる。

【0031】因に、目盛付窓部10及び11を設けるにあたって、まずBGA1の製造行程を終了した後に、オペレータがドリル等の穴開け工具（図示せず）を用いて

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BGA 1の回路基板2及び封止部材3における2個の位置決め孔5及び6を穿設加工する。続いて当該位置決め孔5及び6にそれぞれ透明なエポキシ樹脂を注入して硬化させた後、回路基板2のボール電極端子4を有する面から所定の方眼目盛を、所定のレーザ加工機（図示せず）を用いてレーザ光を照射することによって位置決め孔5及び6の中心位置が基準となるように描画する。例えばこの所定の方眼目盛は、線の幅が0.01〔mm〕、目盛のピッチが0.1〔mm〕とする。また上述の方眼目盛を染料を塗布して描画することにより、オペレータが格段と容易に目視確認することができる。

【0032】さらに上述の実施例においては、BGA 1の回路基板2の面上に格子状に配列されているボール電極端子4の中から同一対角線上で互に対向位置関係を有する2箇所の最端部位に位置決め孔5及び6を設けた場合について述べたが、本発明はこれに限らず、それぞれ当該最端部位以外のボール電極端子4を有する所定の部位に設けても良く、さらにこのときの位置決め孔の個数は2個に限定せず3個以上であつても良い。

【0033】さらに上述の実施例においては、BGA 1の回路基板2の面上に格子状に配列されているボール電極端子4の中から同一対角線上で互に対向位置関係を有する2箇所の最端部位に位置決め孔5及び6を設けた場合について述べたが、本発明はこれに限らず、さらに当該位置決め孔5及び6に加えてもう一方の対角線上で互に対向位置関係を有する2箇所の最端部位の一方又は両方に位置決め孔を設けるようにしても本発明を適用し得る。

【0034】さらに上述の実施例においては、位置決め孔5及び6をBGA 1の回路基板2及び封止部材3を共に貫通させて穿設した場合について述べたが、本発明はこれに限らず、回路基板2の面上に配列されているボール電極端子4の有する所定の部位に位置決め孔を穿設したときに回路基板2のみ貫通して封止部材3が貫通しない場合には、当該部位に位置決め孔を穿設するようにしても本発明を適用し得る。

【0035】さらに上述の実施例においては、回路基板

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2の面上に配列されているボール電極端子4の有する所定の部位に位置決め孔を穿設した場合について述べたが、本発明はこれに限らず、回路基板2の面上のボール電極端子4の有する部位以外の所定部位に位置決め孔を設けるようにしても良い。

【0036】この場合、BGA 1の各ボール電極端子4をそれぞれ主基板7の対応するランドに正確に位置合わせしたときに、回路基板2に穿設された所定数の位置決め孔に対応する主基板7の所定位置にそれぞれ位置合わせ用のマークを付けておくようにする。これによりオペレータは、位置決め孔とこれに対応するマークとの相対位置を容易に確認することができ、かくして上述の場合と同様の効果を得ることができる。

【0037】

【発明の効果】上述のように本発明によれば、実装用電子部品を主基板にマウントしたとき、当該実装用電子部品の各貫通孔をそれぞれ対応する主基板上の認識マークと位置合わせするようにしたことにより、主基板に対する実装用電子部品の実装位置合わせを容易にし得る。かくして従来では外部から確認し得なかつた実装用電子部品と主基板との位置合わせ状態を当該実装用電子部品の上方から直接目視確認することができる実装用電子部品及び実装用電子部品実装方法を実現し得る。

【図面の簡単な説明】

【図1】本発明の一実施例によるBGAを示す斜視図である。

【図2】本発明によるBGAの主基板へのマウント状態を示す平面図である。

【図3】本発明によるBGA及び主基板の位置合わせ状態を示す部分的平面図である。

【図4】他の実施例によるBGA及び主基板の位置合わせ状態を示す部分的平面図である。

【符号の説明】

1……BGA、2……回路基板、3……封止部材、4……ボール電極端子、5、6……位置決め孔、7……主基板、8、9……ランド、10、11……目盛付窓部。

【図1】

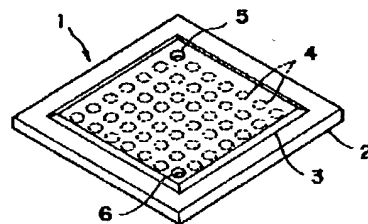


図1 実施例の構成

【図2】

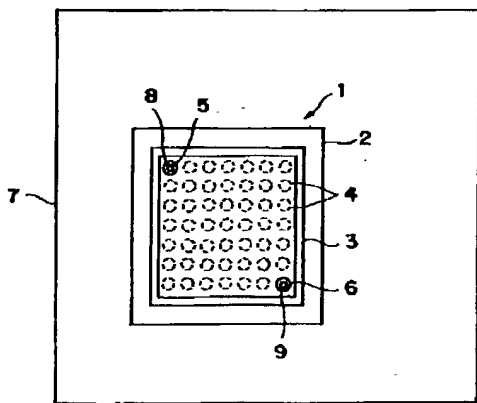


図2 BGAの主基板に対するマウント状態

【図3】

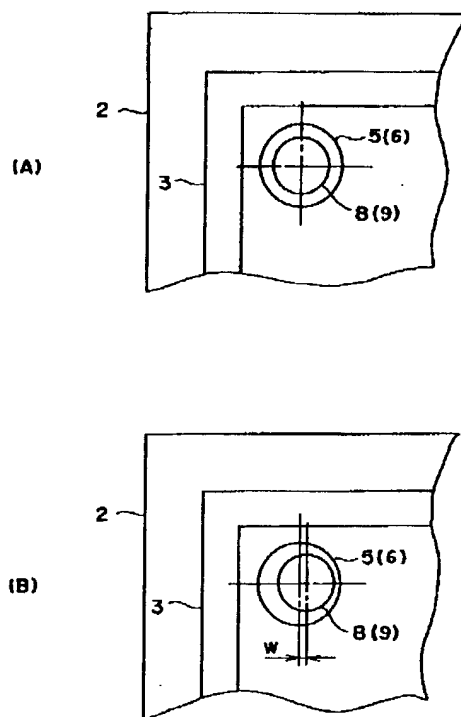


図3 BGA及び主基板の位置合わせ状態

【図4】

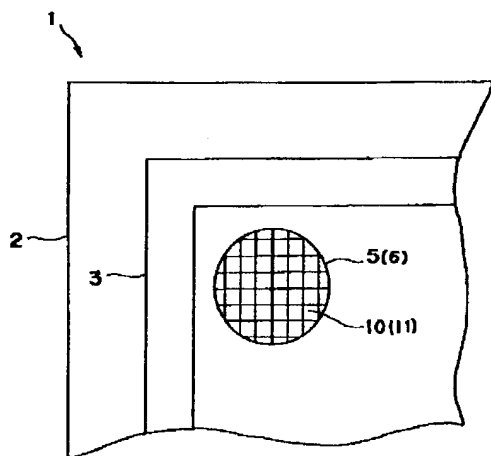


図4 他の実施例